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STATUS REPORT ON PESTICIDES

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ANNEXURES ;

1. DEFINITIONS AND INTERPRETATION

Pesticides are chemical materials which kill living organisms by poisoning. They are used to destroy organisms directly or indirectly harmful to man, which organisms are normally referred to as **Pests**.

A more comprehensive definition or proper and legal interpretation of the terms , **Pest** and **Pesticide**, is given in Section 27 of the Control of Pesticides Act No. 33 of 1980 (Annexure I).

2. THE GENERAL BENEFITS AND HAZARDS OF PESTICIDES

Text :

The most important feature of Pesticides is that, if responsibly and efficiently used, they produce a very quick, effective and economic destruction of pest organisms. By the elimination of pests there can be a great increase in the production of food necessary for human consumption and a great improvement in the maintenance of human health necessary for normal human activity. The latter is achieved indirectly through the destruction of vector insects which carry and transmit pathogens of man and domestic animals. Pesticides are therefore, accepted as important and even essential inputs in modern Agricultural, Horticultural and Public Health practice and are in very popular demand.

However, the action of pesticides which is achieved through poisoning, to which feature they also owe their effectiveness, carries serious hazards to life, in the handling, disposal and use of these materials.

Consequently, knowledge, skill and responsibility have to be exercised in their handling, use and application at every stage, and must as far as possible be made compulsory. If adequate protection from the hazards of poisoning is not exercised in handling and application, the resulting indiscriminate use of pesticides can lead to a direct destruction of human life or indirect damage through the poisons' contamination of the environment. The most poisonous pesticides are necessarily the most effective and also the most hazardous to use. The World Health Organisation (WHO) has classified Pesticides into five classes according to the hazard their use entails. They are :-

Class Ia. Extremely hazardous
Class Ib. Highly hazardous
Class II. Moderately hazardous
Class III. Slightly hazardous
Class IV. Negligibly hazardous

Hazards

117 chemicals in more than 210 formulations are now available in retail outlets in Sri Lanka. A toxic substance attacks the nervous system, or the cardiovascular system or the cellular metabolism. The actual hazard a compound presents, will depend on its mode of use and the formulation. Certain compounds may be perfectly safe in one type of formulation, but quite unsafe in another ; thus Phorate has a relatively high toxicity (LD_{50} of 02 mg/kg, more toxic than parathion) and would obviously be dangerous in a liquid formulation, but dispensed in granules it is virtually safe except for a slight dust hazard.

Some dusts on the other hand, can be dangerous, especially if the particle size is small, since the material is not only blown about but also penetrates deeply into the respiratory tract.

In general, pesticides can be inhaled, ingested or absorbed through the skin. The hazard to users is dependent not only on the extent and route of exposure, but on several other factors, such as the relative rates of absorption from the skin and lungs, particle sizes of dust and aerosols and the duration of work. The dermal route offers the greatest potential for occupational exposure. Oral ingestion is the most frequent route of exposure in cases of non-occupational poisonings. Dermal exposures have resulted in deaths of small children who had come into contact with presumably empty containers for highly toxic pesticides. Children have become victims of pesticide poisoning as a result of respiratory and dermal exposure while playing in pesticide sprayed fields and vegetable plots. When toxic chemical substances are widely distributed, freely available and used in agriculture, risks may arise at any stage of use in an agricultural society.

The agricultural worker may absorb some of the chemical from repeated or prolonged skin contamination by the dilute material during spraying, or inhale the mist or dust or swallow traces of the material from conveying it to the mouth by fingers, food, drink or sucking or blowing out blockages in spray jets. Children may accidently 'taste' pesticides out of curiosity when the containers are within easy reach, they may even play in fields sprayed with pesticides and inhale pesticides. Careless disposal of used containers or their washings may lead to accidential poisoning or the contamination of food stuffs or water supplies.

The easy availability of agricultural chemicals labelled " poison " could facilitate suicidal or homicidal activities. Many such hazards have been demonstrated by isolated incidents in Sri Lanka and other developing countries.

III. THE LEGAL STATUS OF PESTICIDES AND THE AUTHORITIES INVOLVED

In view of the great significance of pesticides in modern life, these materials all over the world, and especially in developed countries, are given special legal status and have compulsory provisions governing their production, disposal and sale to the public.

In Sri Lanka the provisions giving Pesticides their status and governing their handling, disposal and use are set down by Parliament in a Legislative Enactment of the Government, known as the Control of Pesticides Act No. 33 of 1980. The provisions of this Act are basic to all actions concerning Pesticides and is attached to this Article as Annexure I. It will be realised from the contents of this Act, that it not only clearly indicates the exact nature of the material that comes within its purview as Pesticides, but also achieves effective control of the situation involved, through a compulsory process of Registration. Such Registration sets out the necessary conditions to which these materials should conform if they are to be imported, sold and used in the country.

The specific Authority appointed for the purpose is the **Registrar of Pesticides**, who is a Technical Specialist in this field. He is, moreover, advised by a Special Expert Pesticide Formulary Committee, appointed by the Minister of Agricultural Development and Research, on matters pertaining to the Act wherein action is necessary.

The Registrar in turn advises the Minister and the Director of Agriculture regarding further procedural action that may be required under this Act from time to time, in order to maintain the effectiveness of the action provided for by the Act in controlling the handling and use of pesticides without set-back to public welfare.

Notification

In Sri Lanka, pesticide poisoning is a notifiable industrial disease under Section 63 of the Factories Ordinance. However, only a very few (less than 0.5%) cases have been notified to the Chief Inspector of Factories up to date.

There have been a few cases of deaths which on investigation revealed exposure of the victims to pesticides in one or other of the pesticide formulation factories. All the victims of pesticide poisoning due to environmental exposure to mixtures of organophosphates and organochlorines contained in pesticide formulations succumbed to death. However, there are instances where formulations containing mixtures of organophosphates and organochlorines have been marketed in this country, violating the international 'Code of Practice' in the Pesticide Industry. Further, there are agricultural users in this country who continue to practice this dangerous scheme of mixing different chemical types prior to spraying.

Malathion Control Bill

This Bill was presented in 1981 to prohibit the possession, transport, sale and use of malathion in Sri Lanka by unauthorised individuals, and for matters connected therewith or incidental thereto.

Because of its great success against a whole host of pests including mosquito vectors of malaria, DDT rapidly swept into agricultural use after the World War II. And, because of its effectiveness against a host of agricultural insect pests and its ridiculously low cost, it was overused, misused and abused due to inadequate basic knowledge, and consequently when it caused problems it was prohibited. The lesson we all should have learned from this is that there is an absolute need for an informed, cautious, and according to available knowledge, correct way of employing a specific chemical for pest control.

It was in this light that the Malathion Control Bill (1981) was a very welcome one, but unfortunately the Act has not yet seen the light of day.. Perhaps, we are in the process of making new 'DDT cases' ?

IV. THE MANUFACTURE, IMPORT AND FORMULATION OF PESTICIDES

Pesticide ingredients are not manufactured in this country. Technical materials are imported in bulk and formulated in the country with other necessary and bulky components in local formulating factories. An appreciable amount of ready-to-use formulated products are also directly imported in bulk and locally divided for marketing.

The local formulation and packaging for distribution is done in formulating factories which come under the Factories Ordinance with regard to operational features for worker welfare and safety.

The following organisations in this country import pesticides;

1. Anglo Asian Co. Ltd.
2. Baur and Co. Ltd.
3. Ceylon Petroleum Corporation

4. Chemical Industries (Colombo) Ltd.
5. Ciba-Geigy
6. FMC South East Regional Office
7. Harrison & Crossfield (Colombo) Ltd.
8. Haychem Ltd.
9. Hoechst
10. J L Morrisons Sons & Jones (Ceylon) Ltd.
11. Lankem Ltd.
12. Mackwoods Ltd.
13. Union Carbide Ceylon Ltd.
14. Some Private Minor Importers.

These leading importers are generally the sole agents for a particular trade mark and brand name products and operate either in association with the parent company which has shares in the local operating associate company or are direct agents of manufacturing (parent) companies.

Imports are mainly from Western countries from the following manufacturers ;

France	Rhone Poulano
Italy	Montidison
Switzerland	Sandoz, Ciba-Geigy
UK	ICI, Shell
USA	Rohm & Hass, Dupont, Monsanto, FMC
W. Germany	Hoechst, Bayer, BASF

The bulk of imports is from West Germany, UK and USA. Pesti- : are also imported from Asian Countries such as Japan, Taiwan, Malaysia, Singapore and China (Annexures II and III).

The handling and disposal in formulating factories have to be carried out incorporating specific safeguards against container damage, accidental spillage and exposure risk to workers. While these are generally observed by the major pesticide companies in their premises, there is much need for improvement in most cases of agencies operating in Sri Lanka.

Formulation

In all pesticide work the greatest hazard lies in the handling of concentrates. In transferring concentrates from drums, either threaded taps or 'drum-pumps' of standard design are used. However, this practice is not strictly followed in most of our factories. Transferring of concentrates may be done either by suction or manually pouring them into the mixer. After formulating, the pesticides are filled bottles by automatic filling machines or manually. Tightening of the bottle tops are often done manually and some times by machine. All these processes from formulation up to the tightening of the bottle tops in some cases are done in open buildings.

In these operations exposure of the worker to pesticides and/or the release of pesticides into the working environment is possible. If these operations could be enclosed or if they are partially enclosed and satisfactorily exhaust ventilated, then the release of pesticide into the working environment would be at its minimum.

In Sri Lanka, the operations for liquid pesticide formulation are partially enclosed and to some degree exhaust ventilated. As a matter of fact, devices for exhaust ventilation in some cases have been faultily installed, disregarding the fundamentals of occupational

safety, health and engineering practice, thus defeating the purpose of installing such systems. In some formulation factories, the environment, the materials including the bottles, parts of exhaust ventilation systems and the worker and his clothing are subjected to some degree of contamination by pesticides in the working operations. The conditions are common to most of the factories, differing only in degree.

Health and Welfare Facilities

The pesticide formulations are carried out in premises defined as factories under the Factories Ordinance, and hence provisions for eye protection facilities, lighting, washing facilities, meal room facilities, first aid facilities, sanitary conveniences, should conform to the requirements of the regulations framed under the Factories Ordinance.

Such facilities as are provided in most of the pesticide formulating factories do not strictly conform to the requirements of the respective regulations. In fact, specialised facilities for washing, eye protection, accommodation of work clothes, laundering of work clothes, shower facilities in case of accidental contamination of pesticides, are specified for pesticide hygiene purposes in addition to the requirements of the regulations under the Factories Ordinance. Special or sophisticated fire fighting facilities and eye washing facilities must be made available in each bay of the pesticide formulation factories. These are not adequately available in most of the factories of Sri Lanka.

Environment ;

In most of the formulating factories the working environment is somewhat contaminated with pesticides but the degree of contamination varies from factory to factory. Satisfactory industrial ventilation systems have been installed and air pollution control methods are practised only in one of the factories. Facilities for the collection of all the liquid wastes and for effluent treatment and for incineration of solid wastes are also available in the said factory.

Empty Bulk Containers

Empty pesticide containers such as drums and barrels are sometimes sold in the open market by the importers. There were instances when such containers have been used for storing edible oils with serious consequences to those who have consumed the said oils which had become contaminated with organophosphorus compounds.

It is a must that all the empty containers should be decontaminated and then be flattened and disposed or recycled.

THE TYPES OF PESTICIDES IN COMMON USE ;

Chemical Types

For better understanding of the toxicity of pesticides, it is necessary to give due consideration to their chemical characteristics and pharmacological activity in classifying them. Based on their chemical composition the pesticides that are formulated can be broadly grouped under the following headings :

Organophosphorus Compounds ;
Organocarbamate Compounds ;
Organochlorine Compounds; and other
Miscellaneous Chemicals.

Organophosphorus Compounds ;

Organophosphates poison insects and mammals primarily by phosphorylation of the acetylcholinesterase enzyme at nerve endings. The enzyme is critical to normal transmission of nerve impulses from nerve fibres to innervated tissues. Depression of respiration is the usual cause of death in organophosphate poisoning. Recovery depends ultimately on generation of new enzyme. In many countries insecticides have been involved in human poisonings and organophosphorus compounds have most frequently been found to be the offending agents. Hence these are considered high risk compounds. In Sri Lanka the organophosphorus compounds were responsible for 76% of the poisonings. (Jeyaratnam et al, 1982).

Parathion and Malathion

Parathion became one of the most widely used organophosphorus insecticides because it exhibits a wide range of insecticidal activity and suitable physical and chemical properties such as low volatility and sufficient stability in water and mild alkali. It continues to be used extensively in agriculture, but because of its high mammalian toxicity, by all routes of exposure, other less hazardous compounds have begun to take its place. Parathion has the well known distinction of being the pesticide most frequently involved in fatal poisoning under a variety of circumstances.

Careful observation on some of these cases has made it possible to delineate accurately the signs and symptoms of poisoning in man, while the efficacy of different kinds of treatment has also been demonstrated. By-products can develop in long-stored malathion which strongly inhibit the hepatic enzymes operative in malathion catabolism, thus enhancing its toxicity. An 'epidemic' of poisoning due to malathion occurred among field workers in a malaria control programme in Pakistan. 2,000 workers were estimated to have had at least one episode of malathion poisoning. 5 of these were fatal. A combination of poor pesticide handling techniques and the use of an unusually toxic formulation (due to the presence of toxic by-products) contributed to this episode. However, despite its extensive use, there have been only a few cases of poisoning by malathion. (WHO 1962).

Organo Carbamate Compounds

The insecticidal carbamates give rise to more rapidly reversible cholinesterase-inhibitor complex. They act as rapidly reversible inhibitors of cholinesterase by blocking the site of attachment of the enzyme to the substrate by strong attachment to both the anionic and esteratic sites. However, enzyme activities commonly revert to normal within a few minutes or hours. They are not, therefore, reliable detectors of carbamate poisoning ; i.e. intoxication may exist when blood cholinesterase activities are normal. A normal value does not preclude carbamate insecticide poisoning. Whenever possible, comparison of the test sample with pre exposure values offers the best confirmation of excessive carbamate absorption ; a depression of 25% or more is strong evidence of excessive absorption.

Measurement of carbamate metabolites in urine within 48 hours of exposure represents a specific and sensitive method for confirming absorption of several pesticides of this class.

Organochlorine Compounds

These are groups of insecticides which include DDT and related compounds, BHC and the Cyclodienes, all of them contain carbon, hydrogen and chlorine in their molecules. The US Environmental Protection Agency has sharply curtailed the availability of many organochlorines, particularly DDT, dieldrin and chlordane. Others, however, are still the active ingredients of various home and garden products and some agricultural and pest control agents. Lindane may no longer be used in continuous vaporizers, but it is the active ingredient of many products for pest control in the home and on the farm.

DDT

DDT is one of the most economical insecticides ever sold. Some insects in a number of countries have become resistant to DDT. The usage of DDT in Sri Lanka in 1971 was over 2.5 million pounds. It was banned from agricultural uses in 1972 and restricted for health purposes. The reason for such restriction is that spraying for mosquito control in and around human dwellings and mosquito breeding areas is in very much higher concentrations than those used for agricultural purposes. The indiscriminate use has facilitated the selection and growth of DDT resistant strains of mosquito. However, this action was taken too late and resistant strains of the vector of malaria appeared. DDT was therefore not used after 1976.

The import, packing, storage, transport, sale and use of DDT is prohibited in Sri Lanka. In 1973, DDT was declared to be an environmental hazard in the USA due to its long residual life and to its accumulation through foods chains where it was proved to be detrimental to certain forms of wildlife. (Eg. Breakage of shells of predatory birds prior to hatching)

The prospect of possible ecological imbalance from continued use of DDT, the uncertainity as to the effect, if any, of continued prolonged exposure and storage of low levels of DDT in humans, and the development of resistant strains of insects have promoted the Environmental Protection Agency to markedly restrict the use of DDT in USA. Several other countries have taken similar action. However, because of its relatively low cost and unavailability of substitutes that are both safe and effective there continues to be interest in its toxicity and its continuing presence as an environmental contaminant in spite of curtailed use.

BHC

The mode of action of BHC is also not completely understood, but its effects on insects and mammals superficially resemble those of DDT and are probably brought on by a sodium-potassium imbalance in the neurons. It is known to be a neurotoxicant whose effects are normally seen within hours and result in increased activity, tremors and convulsions leading to prostration. The beta isomer of BHC is excreted very slowly, requiring months or even years for elimination after human absorption.

Cyclodienes

Generally, the cyclodienes, (aldrin, chlordane and endosulfan) are insecticides and are stable in soil and relatively stable to the ultraviolet action of sunlight. Consequently, they have been used in great quantity as soil insecticides. Because of their persistence, the use of cyclodienes on crops was restricted in USA. Undesirable residues remained beyond the time for harvest.

The modes of action of the cyclodienes are not closely understood. It is known that they are neurotoxicants that have effects similar to those of DDT and BHC. They appear to affect all animals in generally the same way, first with nervous activity followed by tremors, convulsions and prostration. The cyclodienes undoubtedly disturb the delicate balance of sodium and potassium within the neuron, but in a way differing from that of DDT and BHC.

Chlordane has apparently induced a few cases of self-limited megaloblastic anaemia after protracted low-level exposures. The constituents of chlordane, except heptachlor and oxychlordane, are excreted rapidly by humans, usually within 3-4 days of ingestion. Dieldrin, heptachlor, and oxychlordane are excreted within weeks to several months of absorption by humans.

2,4-D and 2,4,5-T

These are widely used in agriculture for weed control. These pesticides are not very toxic though they can cause irritation of the skin and also some discomfort if they get into the eyes or are inhaled in excessive quantities.

However, 2.4.5-T is often contaminated with varying amounts of 2,3,7,8-tetrachloro-dibenzo-p-dioxin (TCDD). In amounts in excess of 0.5 mg/kg TCDD, such symptoms as impaired liver function, nephropathy, gastro intestinal irritation and irritation of the central nervous system, have been reported. GLC methods are available for detecting and measuring these compounds in blood and urine but not done in a systematic manner.

VI THE NATURE AND EFFECTS OF PESTICIDE POISONING AND NECESSARY SAFEGUARDS

Identification in Biological Fluids

Organochlorine pesticides and/or metabolites can usually be identified in blood or urine by gas-liquid chromatographic examination of samples taken within 72 hours of poisoning. Presently these tests are not being performed in Sri Lanka.

Biological Monitoring

The absorption of organophosphorus compounds by man and animals results in the depression of one of the series of enzymes, called the cholinesterase enzyme. In the normal healthy state, the blood of man, animals and birds contain cholinesterase enzymes at fairly stable levels and therefore the measurement of blood cholinesterase levels is an invaluable means of detecting unsafe working practice or of confirming that an indisposition is due to exposure to organophosphates. Several methods are available for the determination of cholinesterase activity. Experience to date is that organophosphate poisoning is always associated with marked and readily determinable cholinesterase inhibition. It is advisable to determine the activity of blood cholinesterase regularly in persons exposed to organophosphorus compounds.

If the activity of their blood cholinesterase decrease by 25% or more from a well established pre-exposure value, the victim should be removed from any further exposure to organophosphorus compounds. About 3% of individuals have a genetically determined low level of plasma cholinesterase. These persons are particularly vulnerable to the action of cholinesterase-inhibiting pesticides and to the drug succinylcholine, often administered to surgical patients. The RBC acetylcholinesterase is less likely than the plasma enzyme to be affected by factors other than organophosphates.

Delayed Effects

A few organophosphorus compounds have been shown to possess a delayed neurotoxic action. It has been postulated that the neurotoxic effects of organophosporus compounds might not be due to cholinesterase inhibition. However, no good correlation has been obtained between the inhibition of cholinesterase and the neurotoxic effects.

But, phosphorylation of 80% or more of the neurotoxic protein by neurotoxic organophosphorus compounds is reliably correlated with clinical neuropathy. Several serious episodes of poisoning have occurred from unintentional contamination of food by tri-orthocresyl phosphate.

In Sri Lanka an outbreak of acute polyneuropathy affecting over 20 young females has been recorded. The cause of neuropathy was traced to tricresyl phosphate found as a contaminant in edible oils. (Senanayake and Jayaratnam, 1981).

Cause of Death in Anticholinesterase Poisoning

The following main factors have been shown to be operative as causes of death in poisoning by cholinesterase inhabitors.

Respiratory System : increase of secretion, bronchospasm, neuromuscular block of respiratory muscles, paralysis of respiratory centre, asphyxia.

Circulatory System : bradycardia, decreased cardiac output, cardiac arrest, paralysis of vesomotor centre

Central Nervous System : convulsions

Death appears to be primarily asphyxial in some instances and cardiovascular in others (WHO 1962).

Carcinogenicity

There is some evidence that these compounds have contributed to increased incidence of tumors in test animals, and the subject of carcinogenic potential of the organochlorine insecticides remain an area of controversy and continued research.

LD_{50} Etc

LD_{50} mg/kg : The LD_{50} value is a statistical estimate of the number of milligrams of toxicant per kilogram of body weight of the animal required to kill 50 percent of a large population of the test animal. It is normally used as a suitable indication of toxic hazards.

Table I lists some of the most important pesticides currently in use in Sri Lanka, approved by the Pesticides Formulary Committee. The pesticides are grouped under five categories according to the WHO Classification of Pesticides by Hazards, viz., Extremely Hazardous, Highly Hazardous, Moderately Hazardous, Slightly Hazardous and unlikely to present acute hazards in normal use.

The Table will also indicate those compounds which are classed as specified or restricted compounds in the developed countries. The following are the entries and abbreviations used in the Table.

H Herbicide
I Insecticide
L Larvicide

Chemical Type — Only a limited number of chemical type are shown, though it is generally acceptable, it is liberally used as per author's convenience.

C Carbamate
OC Organochlorine
OP Organophosphorus

Physical state refers only to technical compounds

L Liquid
S Solid

Route : Oral route values are used unless the dermal route values place the compound in a more hazardous class or unless the dermal values are significantly lower than the oral values, although in the same class.

TABLE (1)

	NAME	MAIN USE	CHEMICAL TYPE	PHYSICAL STATE	ROUTE	LD_{50} mg/kg	RESTRICTED(USA)	SPECIFIED(UK)
EXTREMELY HAZARDOUS	Chlorfenvinphos	In	OP	L	Oral	10		Yes
	Parathion	In	OP	L	Oral	13	Yes	Yes
	Parathion methyl	In	OP	L	Oral	14	Yes	Yes
	Phosphamidon	In	OC	S	Oral	17		Yes
HIGHLY HAZARDOUS	Aldrin	In	OC	S	Oral	98		
	Carbofuran	In	C	S	Oral	08		
	Carbophenothion	In	OP	L	Oral	32		Yes
	Demeton-S-methyl	In	OP	L	Oral	40		Yes
	Dichlorves	In	OP	L	Oral	56		Yes
	Fenthion	In,L	OP	L	Dermal	330		
	Methamidophos	In	OP	L	Oral	30		
	Methomyl	In	C	S	Oral	17		Yes
	Monocrotophos	In	OP	L	Oral	14		
	Omethoate	In	OP	L	Oral	50		Yes
MODERATELY HAZARDOUS	BHC	In	OP	S	Oral	100		Yes
	BPMC	In	C	S	Oral	110		
	Buencarb	In	C	S	Oral	87		
	Carbaryl	In	C	S	Oral	500		
	Chlordane	In	OC	L	Oral	460		
	Diazinon	In	OP	L	Oral	300		
	Dimethoate	In	OP	S	Oral	147		

	Endosulfan	In	OC	S	Oral	80	
	Formothion	In	OP	L	Oral	365	
	Isoprocarb	In	C	S	Oral	403	
	MPMC	In	C	S	Oral	380	
	Paraquet	H		S	Oral	150	
	2,4,5-T	H		S	Oral	500	
MODERATELY HAZARDOUS	Phenthoate	In	OP	L	Oral	400	
	Phoxim	In	OP	L	Derm-al	1,000	
	Pirimiphos-methyl	In	OP	L	Oral	1,415	
	Porpoxur	In	C	S	Oral	95	Yes
	Quinalphos	In	OP	L	Oral	65	
SLIGHTLY HAZARDOUS	Acephate	In	OP	S	Oral	945	
	Malathion	In	OP	L	Oral	2,100	
	Trichlorphon	In	OP	S	Oral	560	
UNLIKELY TO PRESENT ACUTE HAZARDS	Methoxychlor	In	OC	S	Oral	6,000	

Malathion; LD_{50} value can vary according to impurities. This value has been adopted for classification purposes and is that of a technical product conforming to WHO specifications. An 'epidemic' of poisoning due to malathion occurred among field workers in a malaria control programme in Pakistan. 2,800 workers were estimated to have had at least one episode of malathion poisoning. 5 of these were fatal. A combination of poor pesticide holding techniques and the use of an unsually toxic formulation (due to the presence of toxic by-products) contributed to this episode.

Paraquet: Paraquet has serious delayed effects if ingested. It is of low hazard in actual use, but very dangerous if taken by mouth accidentally.

2,4,5-T; 2,4,5-T may contain a contaminant TCDD which affects toxicity. It should not exceed 0.5 mg/kg technical material.

LD50mg/kg; The LD_{50} value is a statistical estimate of the number of mg of toxicant per kg of body weight required to kill 50% of a large population of test animals ; the rate is used unless otherwise stated.

Deaths Due to Pesticides

In 1973, it was estimated on the basis of a mathematical model that accidental poisoning by pesticides resulted in a global total of approximately 500,000 cases each year which included 50,000 deaths per year (WHO, 1973). Such estimates for Sri Lanka were not available during the said period. However, during the period 1975-1980, an average of approximately 13,000 victims were admitted each year to Government Hospitals for treatment of acute pesticide poisoning and approximately 1000 of these patients died each year. (Jeyaratnam, et al, 1982).

Mass Acute Poisoning

Many cases of mass acute poisoning have been reported. We may consider many of these "Man-made Outbreaks" as accidental, but basically they are all caused by the lack of good , planned and well organised preventive and precautionary measures.

Table II illustrates a few mass acute cases of pesticide poisoning :

TABLE II

Kind of Accident	Pesticide Involved	Material Contaminated	Number Affected	Fatal Cases	Country
Spilled during transport and/or storage	Endrin	Flour	159	0	Wales
	Endrin	Flour	691	24	Qatar
	Endrin	Flour	183	02	Saudi Arabia
	Parathion	Wheat	360	102	India
	Parathion	Barley	38	09	Malaysia
		Flour	200	08	Egypt
		Flour	600	88	Columbia
		Sugar	300	17	Mexico
Accidental Ingestion	Hexachlorobenzene	Seed Grains	3000	3-11%	Turkey

MASS POISONING - SRI LANKA

TABLE III

Kind of Accident	Pesticide Involved	Material contaminated/ cause	Number Affected	Fatal Cases	Area
Food Contamination	Parathion	Flour	12	02	Piliyandala
	Parathion methyl	Flour	30	03	Rambodagala
	TOCP/TCP	Edible oil	20	0	Kandy

Occupational - Extra Liquid Spraying 09 01 Horana

Occupational Exposure ;

In Sri Lankan factories hundreds of workers are employed for formulation and repacking of pesticides. Health and safety measures differ from factory to factory and the working environment is polluted with pesticides in varying degrees. In general, a majority of the workers manifest symptoms of pesticide absorption. The health status of the workers in all cases is not checked regularly, but facilities are available for the determination of cholinesterase activity in some of the factories. 15% of these workers manifest unsatisfactory cholinesterase levels. A summary on the risk to workers in the formulation factories is presented in Annexure V.

More than 10,000 workers are engaged in anti-malaria, anti-filaria, animal husbandry and vector-disease control activities in Sri Lanka. Most of them are not monitored for occupational exposure to pesticides. In a study of public health workers exposed to fenthion, it was observed that the symptoms likely to result from exposure were commoner in the exposed group of workers.

It was evident that spraymen could develop all other symptoms of poisoning without a concommitant depression of blood cholinesterase levels. Further, it was noted that none of the workmen used any form of protective clothing, a situation made worse by poor personal hygiene during spraying. (Jeyaratnam and Ponnambalam, 1980). Another study concerning the health status of animal husbandry workers in Sri Lanka reveals that while there is a marked decrease in the cholinesterase activity of the workers, such a decrease was not observed in the animals treated with these pesticides (Ponnambalam and Gunawardena, 1980).

Investigation of an incident in the plantation sector revealed that out of the 20 workers who were detailed to spray a particular pesticide, 9 were hospitalised as a result of poisoning, out of whom one died. In this particular instance, the concentration of the active ingredient after dispensing for spraying, as recommended by the Formulator of the said pesticide, was found to be 10 times that practised in other countries. An estimate of pesticide poisoning in the agricultural sector is presented in Chapter VIII.

VII. TRANSPORT, STORAGE AND MARKETING OF PESTICIDES

In the Port of Colombo, special facilities for the storage of pesticides are not available. They are not even stored in specified areas, but are stored with other items indiscriminately. The importing companies import them in several packages and the employees of the Port are not aware of the hazardous nature of the chemicals contained in the packages. Safe handing and storing will be easier, if each consignment of pesticides is imported in one single package clearly labelled as pesticides, with suitable danger mark or these can be imported in cargo containers.

These packages containing pesticide ingredients are transported from the Port by lorries, to the stores of the Formulating Factories. In unloading, which is done by contract labour, they usually do not adopt either mechanical safety or pesticide chemical handling safety measures which are essential in handling super concentrates. The bulk packages may be casually thrown out of the vehicles or let down on unreliable, unsafe wooden inclined planks. This practice almost invariably causes damage to the containers resulting in the release of pesticides into the environment, particularly when containers are not strong enough to withstand the strain.

Most of these stores have not been planned with pesticide safety and fire safety in mind or to contain accidental spillage of pesticides.

Distributors

All the companies have their own distributors in each of the districts of Sri Lanka with more than one distributor in agricultural areas. The function of the distributors is to carry adequate stocks during active seasons and to distribute to retailers.

Retailers

The retail dealers include Agrarian Service Centres, Multi-purpose Co-operative Societies and retail Shops which are also engaged in selling food items to the consumers. The main role of the retail shop is to store popular varieties of agro-chemicals in adequate quantities and sell them to farmers at the retail price. In many of these retail shops satisfactory storage facilities for pesticides are lacking.

In some districts it is a common sight to see pesticide bottles stacked over or arranged directly above consumable food items. There have been instances in this country where food items, such as flour and pulses were contaminated as a result of pesticide dispensing in multi-purpose co-operative society retail outlets and grocery shops, resulting in widespread pesticide poisoning.

Pattern in an Agricultural Area

Analysis of the pattern of sudden deaths in an agricultural area of the island was carried out.

This study reveals that out of a total of 977 cases investigated, 407 (41.6%) involved pesticides of which 373 were cases of suicide, 29 were due to occupational exposure to pesticides and 05 were children under 05 years of age. A majority of the victims were people within the age group of 21-30 followed by those in the less than 20 group. Though 186 of them were admitted to hospital more than 90% of them had not received any first-aid care, prior to hospitalization. 65 victims died as a result of job related accidents. Out of whom 29 (44.5%) died due to pesticide poisoning as a result of occupational exposure, 40 deaths were due to tractor accidents and 03 due to lightning.

Hence, occupational pesticide poisoning far outnumbers the deaths due to agricultural machinery. (Ponnambalam, 1983). This is in sharp contrast to the pattern in developed countries.

Fatal pesticide poisoning in the UK is comparable to those fatalities caused by / shotguns and lightning in farming situations/agricultural environment. Also fatal accidents from agricultural machinery far outnumber those from poisoning from pesticides in the UK. Furthermore, some of the greatest disasters from pesticide poisoning have been not among agricultural workers, but among consumers of food accidentally contaminated with pesticide.

Guidlines on the Safe Use of Pesticides;

Agricultural chemicals must always be handled in such a way that the possibility of harm to non-target organisms (including man), either through contamination of food and water or by contact, is kept to a minimum. All chemicals should be treated with care whether they are known to be poisonous or not.

Accidents are few when the individual knows and follows the proper procedures.

* Read the ;abel, especially the safety precautions, carefully before use.
* Use all products as recommended on the label and not use persistent chemicals where there are less persistent and equally effective alternatives.
* Prevent drift on to other crops and take care to prevent contamination of any water source whether for drinking or irrigation purposes, eg. streams or ponds or any effluent water in, for eg. ditches or cess pools.
* Safely dispose of all used containers. Liquid contents must first be washed out thoroughly and the washings added to the spray tank in the preparation of the spray liquid. Packages containing powders or granules must be completely empty before disposal. Burn empty bags, packets and polythene containers. Puncture non-returnable metal containers or dispose of them with other refuse. On no account use empty pesticide containers for any other purpose.
* Keep spray equipment clean and in good condition. Do not blow, suck or put mouth to a jet, nozzle or other spraying or soil-application apparatus that has been used for pesticides.
* Avoid prolonged exposure to pesticides. Users shall not be exposed to extremely hazardous and highly hazardous pesticides for more than three hours a day. Special care should be exercised to prevent inhalation and contamination of the skin when handling insecticidal concentrates (i.e. use respirators, impermeable gloves).
* When pesticide contamination of the body occurs, wash the affected area quickly and throughly with soap and water. Wash with soap routinely after spraying.

* Return unused materials to safe store for pesticides **OUT OF REACH OF CHILDREN.**
* **KNOW THE EMERGENCY MEASURES FOR HANDLING VICTIMS OF ACCIDENTAL POISONING.**

First Aid Measures

If a person who has been using poisonous pesticides becomes ill, first aid should be given and the patient should be taken as quickly as possible to a hospital for medical attention. It is necessary for both the doctor and the hospital to be told also the name of the pesticide the patient has been using and shown any available leaflet or label about the pesticide.

First aid measures involve the following ;

* Stop the patient working and take him away from the spraying area, if possible, into a shelter.
* Keep the patient at rest.
* Remove all protective clothing and any other clothing which may be wet with chemical, taking care not to contaminate your own skin. Wash all the contaminated skin thoroughly with soap and water. Then cover the patient with uncontaminated clothes, rugs or coats, etc.
* If breathing ceases or weakens, start artificial respiration immediately.
* If the patient's eye is contaminated with chemical, make him blink his eyelids under water, or flush the eye (holding it open if necessary) with water, keeping up this procedure for at least 15 minutes. Then cover his eye with a soft pad of sterilised cotton wool kept in position by a shade or bandage applied lightly.
* In transporting the patient to hospital, make sure breathing is maintained, see that the breathing passages are clear and prevent the inhalation of vomit.

* In cases of organochlorine (chlorinated hydrocarbon) poisoning causing convulsion, loosen all clothing and put something strong between the teeth to prevent biting of the tongue.
* In case of organophosphorus or carbamate poisoning - watch the patient's breathing most carefully as it may stop suddenly. Start artifical respiration at the first sign of failure and continue for as long as necessary.

If the victim is conscious and has orally consumed pesticide or a pesticide contaminated food item, vomiting may be induced by giving solutions of bicarbonate of soda ( ) or a very strong solution of common salt.

IX. RECOMMENDATIONS IN DEVELOPED COUNTRIES AND FOR SRI LANKA

Approach of the Developed Countries ;

The approach now being echoed in all the developed countries is that the synthesis and use of organic chemicals that have no counterpart in nature, such as most of the synthetic pesticides, must be stopped unless it can, at least, be shown that they break down to biologically inactive products at a rate similar to their rate of production and use, and that their side-effects do not threaten the sustainability of the system.

In the developed countries there are voluntary schemes, such as (1) Agricultural Chemical Approval Scheme, the purpose of which is to enable users to select, and advisers to recommend, efficient and appropriate crop protection chemicals and to discourage the use of unsatisfactory products. (2) Pesticide Safety Precaution Schemes under which the manufacturers concerned agree not to market a product containing any new chemical for use in agriculture or food storage or to introduce a new formulation which could show an increased

hazard, until recommendations for safe use have been agreed with the Government Departments concerned, if necessary on the advice of the Advisory Committee on Pesticides.

In the United Kingdom, most manufacturers of pesticides have an extremely close liaison with the Government Departments responsible for agriculture, health and labour. This has brought into being a series of agreed statutory and voluntary control measures which have gone far to induce the safe use of pesticides in the UK.

Precautionary Measures - UK

The precautionary measures are being tightened rather than relaxed and have already reached the stage that 'clearance for use' is a significant early hurdle facing any new agricultural chemical of high or even moderate toxicity. Manufacturers (or main distributors in the case of imported chemicals) voluntarily submit to the Government detailed technical and toxicological data concerning any proposed new pesticide on new use, where experience from other compounds suggests that any risk to man or animal could arise. These data are submitted before marketing.

The Government's specially created Inter-departmental Advisory Committee considers these data, and advises the Departments what safety measures seem advisable in each instance depending on circumstances. A proposed use may occasionally be rejected as unsafe. A new chemical of high toxicity may promptly be brought within the provisions of the poisons legislation. If personal safety precautions by users seem essential, the chemical may be made a "Scheduled substance" under the Agriculture (Poisonous Substances) Act and Regulations. A chemical of high toxicity and great persistency on vegetation may be restricted to use on non-food crops.

Any incident involving poisoning or risk of poisoning is subject to thorough investigation, and existing machinery for controlling any further risk.

Recommendations

All pesticides are toxic to some degree, and care in handling all types should be routine practice. Even though pesticides may be extremely hazardous, they can be used safely if proper precautions are taken in their packaging and transport, and if the users adopt safe procedures for storage, handling and application of the pesticides and for the disposal of empty containers.

All those handling pesticides should be informed of the risks involved in their use and receive instructions for handling them safely.

Pesticide users having scratches on the skin or skin irritation at places likely to be exposed to the pesticide should not be permitted to work, since such damage is known to facilitate the penetration of the pesticides into the body.

Facilities including soap, should be available for washing the skin and clothing. Compulsory washing after work should be routine in all operations involving pesticides.

Users shall not be exposed to extremely hazardous or highly hazardous pesticides for more than four hours a day.

Workers should not smoke during their work nor eat without first washing their hands and the mouth region, and they should take other simple precautions in places where pesticides are handled.

Education is essential in ensuring the safe use of pesticides, and should cover the hazards of individual products, the routes of entry into the body and the nature of the toxic effects. Such education should be given in all agricultural schools and places of work and the fundamentals included in the secondary school curriculum.

Regular determination of cholinesterase activity is recommended for all those who work with organophosphorus compounds.

The formulators or those responsible for registering the pesticide with the Registrar of Pesticides should ensure that every product offered for sale or otherwise distributed ;

- has been investigated to determine its physical, chemical and toxic properties, and to evaluate the potential hazards of its agricultural use ;
- is packed in accordance with the requirements of the national authorities, in standardized retail containers that will not leak during transport or whilst being opened for use ;
- bears a label which is in accordance with the requirements of the national authorities, and which gives in the language of the region, comprehensive instructions for safe use, warns of possible hazards, specifies the active ingredients and gives guidelines for first aid in case of poisoning (including antidotes).

It should be the duty of the retail dealer ;

- to sell pesticides only in the manufacturer's original package and not to break the manufacturer's package in order to sell a smaller quantity of a pesticide.
- to store pesticides in a locked room or cupboard specifically intended for this purpose.

It should be the duty of the farmer or others responsible for carrying out pest control operations ;

- to provide suitable storage facilities for pesticides ;
- to organise work involving the use of pesticides in such a way as to protect workers against accidents and injury to health ;
- to provide, adequately maintain and periodically inspect equipment and appliances required for worker protection ;
- to ensure that all existing and new machines, applicances and other equipment used in work with pesticides are in keeping with the best standards of Occupational Safety and Health practices and are suitable for the purpose and safe in operation ;
- to ensure that pesticide workers are properly instructed in the hazards of their work and the relevant safety and health precautions ;
- to provide competent supervision of pesticide operations involving a number of workers, to ensure that these operations are carried out in accordance with the relevant regulations of good safety and health practice, and to prevent hazards that may develop due to workers' inexperience or lack of knowledge.

Adequate precautions must be taken to safeguard against container breakage and pesticide leakage or spillage which may result from vehicle movement during transport. All containers should be carefully placed in the vehicle so that they cannot be damaged during transit. Toxic pesticides should not be transported or stacked in close proximity to items which would become hazardous if contaminated.

In the retail dealer's and user's premises ; the pesticide should be stored in a relatively isolated location where they cannot contaminate food or water supplies, they should be kept

in dry and well ventilated special store rooms or cupboards and be kept under lock and key. The stores and the warehouses of all the formulating factories in this country should be modified in terms of the safety and health requirements for pesticide storage. Pesticides should always be kept in original containers. Store premises should have floors which are impermeable and easy to wash. Where pesticides of different chemical types are stored together they should never be allowed to be cross contaminated.

Spillage on concrete floors should be contained by surrounding and covering it with an absorbant material (sawdust) which can be shovelled into a container for disposal. The floor should be scrubbed with water to which may be added a detergent (in the case of chlorinated hydrocarbons) or a weak alkaline solution (in the case of organophosphates).

Empty pesticide containers should be immediately and safely disposed of in a way that presents no hazard to humans, animals or edible substances or valuable vegetation. They should not be kept for any storage purpose whatsoever and should be either destroyed immediately after use, or in the case of valuable containers, returned to the manufacturer, after decontamination where appropriate.

Paper and cardboard packaging should, unless the label indicates the contrary, be burnt and the ashes buried. However, burning pesticide containers may give off toxic fumes, and exposure to these fumes should be prevented. Where large quantities are burned regularly, the installation of a special incinerator is advisable.

Small metal containers should be flattened and glass containers broken ; they should then be buried where they cannot contaminate water supplies.

Empty pesticide drums should never be filled with anything that will come into contact with material for human or animal use or consumption. They may be returned to the manufacturer or buried after crushing or perforation to make them unusable. Prior to burial or despatch, drums should be rinsed out with water to which may be added caustic soda or household detergent.

The formulator, the retail shop dealer or the user shall not permit at any stage of pesticide handling, the mixing of any two pesticides belonging to different chemical types.

The possession, transport, sale and use of pesticides used for public health purposes (malathion, fenthion) shall be legally controlled, restricted and regularised.

All pesticides that are marketed in the country shall have a licence number issued by the Registrar of Pesticides.

Import of poor quality pesticides, pesticides prohibited elsewhere or contaminated pesticides, such as contaminated malathion or 2,4,D and 2,4,5-T shall be prohibited.

Customs Officers shall be adequately trained to enable them to identify the different chemical types imported into this country.

Special regulations should be framed to deal with the handling of the pesticides classed as extremely hazardous and highly hazardous ; and further, all pesticides which are now restricted for use or classed as specified compounds in the developed countries be treated accordingly.

Annex I

PARLIAMENT OF THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

CONTROL OF PESTICIDES ACT, No. 33 OF 1980

[Certified on 5th September, 1980]

Printed on the Orders of Government

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Control of Pesticides Act, No. 33 of 1980

[Certified on 5th September, 1980]

L.D.—O.13/79

AN ACT TO PROVIDE FOR THE LICENSING OF PESTICIDES ; TO REGULATE THE IMPORT, PACKING, LABELLING, STORAGE, FORMULATION, TRANSPORT, SALE AND USE THEREOF ; FOR THE APPOINTMENT OF A LICENSING AUTHORITY FOR PESTICIDES ; FOR THE ESTABLISHMENT OF A PESTICIDE FORMULARY COMMITTEE AND FOR MATTERS CONNECTED THEREWITH OR INCIDENTAL THERETO.

BE it enacted by the the Parliament of the Democratic Socialist Republic of Sri Lanka as follows :—

Short title.

1. This Act may be cited as the Control of Pesticides Act, No. 33 of 1980.

Application of the Act.

2. This Act shall apply to—

(*a*) active ingredients and pesticide formulations with included adjuvants ; and

(*b*) adjuvants other than those included in pesticide formulation if sold for addition at the point of use to the spray tank or other container of pesticide formulations.

Licensing Authority for pesticides.

3. (1) There shall be appointed a Registrar of Pesticides who shall be the licensing authority for pesticides.

(2) The Registrar of Pesticides shall be a person with knowledge of toxicology and biological subjects associated with pest control and shall be responsible to the Director of Agriculture.

Pesticide Formulary Committee.

4. (1) There shall be a Pesticide Formulary Committee (hereinafter referred to as the "Committee")

(2) The Committee shall consist of—

(*a*) the folowing *ex officio* members namely—

(i) the person holding office for the time being as the Director of Agriculture (hereinafter referred to as the "Director"). and

(ii) the person holding office for the time being as the Registrar of Pesticides (hereinafter referred to as the "Registrar") ; and

A 49925 19,600 (80/06)

(b) not more than eight persons who are experienced in the use of pesticide or in pest control and related scientific disciplines who shall be appointed by the Minister :

Provided, however, that no person having a commercial interest in the manufacture, import, marketing, formulation, storage, transport or sale of pesticides shall be so appointed.

(3) The Director shall if present preside at all meetings of the Committee. In the absence of the Director from any such meeting, the members present shall elect one of the members to preside at such meeting.

(4) Every member, other than the *ex officio* members shall, unless he vacates office earlier by death, resignation or removal by the Minister, hold office for a period of three years from the date of the appointment to such office :

Provided that a member appointed in place of a member who dies, resigns or otherwise vacates office, shall, unless he earlier vacates office, hold office for the unexpired part of the term of office of the member whom he succeeds.

(5) The Minister may, by Order published in the *Gazette* remove any member, other than the ex-officio members, from office, without assigning any reason therefor and such removal shall not be called in question in any Court.

(6) Any member other than the *ex officio* members vacating office by the effluxion of time shall be eligible for reappointment.

(7) If any member, is temporarily unable to perform the duties of his office during any period due to ill health or absence from Sri Lanka or for any other cause, the Minister may appoint some other person to act in his place during such period in like manner as such member was appointed in accordance with the provisions of subsection (1).

(8) The Minister may, determine the remuneration of such members and the manner of such payment in consultation with the Minister in charge of the subject of Finance.

Functions of the Committee.

5. (1) The functions of the Committee shall be to advise the Registrar on any important matter relating to the registration of pesticides, approval of containers, and the storage, formulation, import, sale and use of pesticides and such other matters relating thereto as may be prescribed by regulations made under this Act.

(2) (a) The Committee may make rules in respect of all or any of the following matters :—

(i) the procedure to be followed at its meetings ;

(ii) the conduct of its business ; and

(iii) all matters connected with or incidental to the carrying on of its business.

(b) Such rules shall be made at a meeting of all members of the Committee.

(c) No rule made by the Committee shall have effect unless it is approved by the Minister and published in the *Gazette*.

Application for licence.

6. (1) Every person desirous of licensing any pesticide shall make an application to the Registrar in that behalf.

(2) An application under sub-section (1) shall contain the following particulars :—

(a) the name and address of the applicant ;

(b) the name and address of the manufacturer or producer of the pesticide in respect of which such application is made ;

(c) the proposed trade name under which such pesticide shall be marketed or sold ;

(d) a copy of the draft label which shall be affixed on any container in which such pesticide shall be sold ;

(e) samples of the container in which such pesticide shall be distributed or sold ;

(f) a statement of the claim made by the manufacturer or producer of such pesticide as to its uses, potency, shelf-life and effect ;

(g) a statemnt of the composition of such pesticide, its chemical identity, nett weight, its stability in storage, methods of use and date of expiry for usage ;

(h) adequate toxicological data concerning such pesticide including information on antidote ;

(i) methods of analysis of the formulated compound ;

(j) methods for the determination of the residue of such pesticide ;

(*k*) report of official or other experimental stations or laboratory or biological tests concerning the efficacy of such pesticide ;

(*l*) such other information relating to the efficacy or safety of the pesticide as may be required by the Registrar.

(3) Where the information contained in an application made under subsection (1) is given by the applicant in confidence, it shall be treated as confidential by the Registrar :

Provided that the preceding provisions of this subsection shall not apply where it is necessary to divul such information if so required by a court of law.

Considera-tion of application.

7. (1) The Registrar shall, on receipt of an application under subsection (1) of section 6—

(*a*) register the pesticide and issue a licence ; or

(*b*) register the pesticide and, pending the issue of a licence, issue a provisional permit for limited marketing and use of the pesticide in accordance with conditions stipulated in the permit ; or

(*c*) reject the application and state the reasons for such rejection.

(2) The issue of a licence or a permit shall be effective for the period stated in the licence or permit, and shall be renewable on application made in that behalf. Such renewal shall be conditional upon a review by the Registrar of the data on the pesticide in question.

Issue of licence.

8. (1) The Registrar shall not issue a licence under paragraph (*a*) of subsection (1) of section 7 unless the copy of the draft label submitted with the application contains in the Sinhala, Tamil and English languages the following particulars :—

(*a*) the trade name under which the pesticide shall be sold ;

(*b*) the common names of the active ingredients of the pesticide, in characters not smaller in size than half the size of those used for the trade name of the pesticide, and in a position placed directly below the trade name ;

(*c*) a statement of the composition of the pesticide with the chemical identity of the active ingredients expressed on a weight by weight percentage basis, together with the percentage of other materials present, to give one hundred per cent, and in the case of liquid formulations, the active ingredient expressed as grams per litre ;

(*d*) the name and address of the holder of the licence ;

(*e*) adequate directions concerning the manner in which the pesticide is to be used, including information as to the period of time which should elapse between the last application of the pesticide and harvest of the crop to which it is applied and where the Registrar deems appropriate, the shelf-life of the pesticide ;

(*f*) adequate warning and precautionary symbols and statements including first aid and antidote information ;

(*g*) the statement "Registered under the control of Pesticides Act, 1980" which shall be an official symbol indicating that the pesticide has been licensed under this Act and the licence number assigned to it by the Registrar ;

(*h*) any other particulars as may be prescribed by regulations under this Act.

(2) Where licensing of a pesticide has been effected under subsection (1) of section 7 no change in respect of any matters set out in paragraphs (*a*) to (*h*) of subsection (1) of this section shall be made without the prior approval of the Registrar.

Approved pesticide.

9. (1) Where the Registrar issues a licence under subsection (1) of section 7, he shall declare that pesticide to be an approved pesticide.

(2) Every declaration made under subsection (1) shall be approved by the Minister and published in the *Gazette*.

Approved container or package.

10. The Registrar shall, when he approves a pesticide, also approve the container or package containing such pesticide, if he is satisfied, having regard to the conditions required for safe and effective storage and handling of such pesticide, that such container or package is satisfactory.

Cancellation of licence.

11. (1) Where any person contravenes any provision of this Act or any regulation or Order made thereunder, or where the Registrar considers it necessary in the interest of the public to do so, he may, on the advice of the Committee cancel, suspend or modify the licence issued in respect of such pesticide or withdraw, suspend or modify the provisional permit issued to such person.

(2) Where the Registrar cancels, suspends or modifies the licence or withdraws, suspends or modifies the provisional permit issued in respect of a pesticide under subsection (1) he shall state the reasons for such cancellation, suspension, modification or withdrawal as the case may be.

(3) Where any cancellation or suspension takes place in respect of a pesticide under subsection (1) such pesticide shall cease to be an approved pesticide.

(4) Every cancellation or suspension under subsection (1) shall be by Order published in the *Gazette*.

Alteration in package or composition.

12. No alteration in the package, label or composition of a pesticide shall be made by the holder of a licence issued in respect of a pesticide unless an application is made in that behalf and approval obtained from the Registrar in respect of such intended alteration.

Appeals.

13. (1) Any person aggrieved by the rejection of application under section 7 or the cancellation, suspension, or modification of a licence or the withdrawal, suspension or modification of a provisional permit under section 11, may prefer an appeal in writing to the Secretary to the Ministry of the Minister in charge of the subject of Agricultural Development and Research (hereinafter referred to as the "Secretary") against such rejection or cancellation, suspension, withdrawal or modification within sixty days after such decision is communicated to such person and the Secretary may, in dealing with any appeal preferred to him, affirm, vary or annul the order against which the appeal has been preferred.

(2) The decision of the Secretary upon an appeal shall be final and conclusive for all purposes whatsoever, and shall not be called in question in any Court.

Prohibition.

14. No person shall manufacture, formulate, pack or distribute, sell, offer for sale or deliver within the country, any pesticide unless—

(*a*) such pesticide is registered and a valid licence or a provisional permit is obtained from the Registrar; and

(*b*) such pesticide is contained in an approved container or package and an approved label is conspicuously fixed thereon:

Provided, however, that the foregoing provisions of this section shall not apply where any approved research organization imports with the written consent of the Registrar any specified quantity of pesticides or pesticide components for the purposes of research.

Adulterated, decomposed or deteriorated pesticides.

15. No person shall manufacture, pack, distribute, sell or offer for sale or deliver within the country any pesticide, which is adulterated or which has decomposed or deteriorated so as to be ineffective or dangerous or which is packed in containers which have deteriorated or have been damaged as to be dangerous in storage or use.

Storage, transport and sale of pesticides in close juxtaposition with foodstuffs.

16. No person shall store, transport, sell or offer for sale any pesticide in close juxtaposition with foodstuffs or in any such manner as would result in the contamination of such foodstuffs.

Prohibition of import of pesticides except upon approval.

17. No person shall import any pesticide except with the written approval of the Registrar granted on the advice of the Committee.

Advertisement of pesticides.

18. (1) Any written, printed or graphic material relating to and accompanying a pesticide when stored, transported, distributed, sold, offered for sale or delivered within the country shall include the substance of the particulars referred to in section 8.

(2) It shall be unlawful to advertise any pesticide in a manner that is false, misleading or deceptive, and not justified by the conditions of its registration.

(3) Any claim for a pesticide contained in any advertisement or device shall be in accordance with the label statements referred to in section 8, and not be contrary to the requirements of subsection (2) of this section.

Storage of pesticides in bulk.

19. (1) No person shall store pesticides in bulk other than in a special store kept for that purpose. The store shall be kept locked when loading or unloading is not in progress.

(2) A notice shall be displayed in a conspicuous position outside the store indicating the hazardous nature of its contents.

Harvesting of crops.

20. No person shall harvest, or offer for sale any food crops, in which pesticides have been used unless a time limit as may be prescribed by regulations has elapsed between such use and harvest, or if the food crops shall contain pesticide residue in excess of levels as may be prescribed.

Authorized officers and their powers and functions.

21. (1) The Director shall nominate such number of officers of his department as may be necessary to carry out the purposes of this Act, who shall be known as "authorized officers".

(2) An authorized officer may—

(*a*) ascertain whether any person has contravened any provision of this Act or any regulation or Order made thereunder ;

(*b*) obtain samples of pesticides for the purpose of determining whether any deterioration, adulteration or decomposition thereof has occurred ; and

(*c*) do all other acts or things which are connected with or are in furtherence of the exercise, performance and discharge of the powers, duties and functions under this Act.

(3) Any authorized officer may enter any premises, after sufficient notice at all reasonable hours of the day in the discharge of his functions under this Act. Such authorized officer shall not be liable on account of such entry or on account of anything done bona fide in such premises which is necessary in the exercise, performance and discharge of the powers, duties and functions under this Act.

Analysis of samples

22. (1) An authorized officer on obtaining a sample of a pesticide shall forthwith inform the seller or his agent of his intention to have the same analysed by an authorized analyst and shall forthwith divide the sample into three equal parts and cause each part to be marked and sealed in such manner as its nature will permit and shall deliver one part each to the seller or his agent, the authorized analyst and the Registrar.

(2) In the event of a dispute in respect of the result of an analysis the Registrar shall forward such part of the sample as is in his custody to a referee analyst nominated by him.

(3) In any proceedings under this Act the production of a certificate signed by an authorized analyst or a referee analyst with regard to any sample procured for analysis under this section shall be prima facie evidence of the facts stated therein.

Fees.

23. (1) (*a*) Every application for the licensing of a pesticide under section 6, and

(*b*) every appeal against any rejection, cancellation, suspension, withdrawal or modification under section 13,

shall be accompanied by such fee as may be prescribed by regulations made under this Act.

(2) In addition to such fee payable under subsection (1), a levy on the importer, manufacturer, formulator or packer of a pesticide may be prescribed by regulations made under this Act for the general purpose of making proper financial provision for the effective implementation of this Act and of the regulations made thereunder.

Penalty for contravention of this Act.

24. (1) Every person who contravenes or fails to comply with any provision of this Act or any regulation made thereunder shall be guilty of an offence under this Act and shall on conviction by a Magistrate be sentenced to imprisonment of either description for a period of two years.

(2) Where an offence under this Act is committed by a body of persons, then—

(*a*) if that body of persons is a body corporate, every director, manager, secretary or officer of that body corporate ; or

(*b*) if that body of persons is a firm, every partner of that firm,

shall be deemed to be guilty of that offence :

Provided, however, that no such person shall be deemed to be guilty of an offence if he proves that such offence was committed without his knowledge or that he exercised due diligence to prevent the commission of the offence.

Forfeiture.

25. The Court which convicts any person of an offence under this Act, may impose any of the penalties hereinbefore prescribed, and may, if it thinks fit, in addition order that all or any article or articles in respect of which the offence was committed be seized and forfeited to the State.

Regulations.

26. (1) The Minister may make regulations in respect of matters required by this Act to be prescribed or in respect of which regulations are authorized to be made and in particular in respect of all or any of the following matters :—

(i) setting forth the position, size and colouring of the label as well as the system or systems of weights or measures to be stated in the label ;

(ii) setting forth special provisions with regard to the substances or operations which presents a high or unusual degree of hazard ; such special provisions may in particular—

(*a*) provide for the field evaluation of certain substances ;

(*b*) regulate the marketing or distribution of certain substances as may be necessary to safeguard third parties, the environment and wildlife resources other than such noxious plants and animals whose control is desired ;

(iii) fixing the dates on which the marketing and sale of pesticides for which licences are issued under this Act shall cease and the disposal of such pesticides ;

(iv) establishing standards or technical competence and equipment used by any person or body of persons engaged in the manufacture, formulation and packing of pesticides ;

(v) the designation of any product as a pesticide formulation ; and

(vi) the mode and manner of use of pesticides.

(2) Every regulation made by the Minister shall be published in the *Gazette* and shall come into operation on the date of such publication or on such later date as may be specified in the regulation.

(3) Every regulation made by the Minister shall, as soon as convenient after publication in the *Gazette*, be brought before Parliament for approval. Any regulation which is not so approved shall be deemed to be rescinded as from the date of disapproval, but without prejudice to anything previously done thereunder.

(4) Notification of the date on which any regulation shall be deemed to be so rescinded shall be published in the *Gazette*.

Interpretation.

27. In this Act, unless the context otherwise requires—

"active ingredient" means any substance which gives a formulated product its pesticidal properties ;

adjuvant" means any substance used as an aid to the efficacy of a pesticide ;

"Authorized analyst" means the Government Analyst, the Additional Government Analyst, a Deputy Government Analyst, a Senior Assistant Government Analyst, an Assistant Government Analyst and any other person authorized by the Minister by notification in the *Gazette* to act as such ;

"pest" means any insect, rodent, bird, fish, mollusc, nemtode, fungus, weed, micro-organism, virus or other kind of plant or animal life which is injurious, troublesome or undesirable to crops, stored products, processed foods, wood, clothes, fabrics or inanimate objects or which are objectionable from the view point of public health and hygiene, and shall also include ectoparasites and endoparasites of man and domestic animals other than any pest which may be specifically included or excluded by regulations made under this Act ;

"pesticide" means any substance intended for use or used for controlling a pest and shall include active ingredients, adjuvants and pesticide formulations ;

"pesticide formulations" means any mixed or unmixed products sold, supplied, imported for use, or used for one or more of the following purposes, namely, for destroying or repelling any pest within the meaning of this Act or for preventing its growth or mitigating its effects, as a plant regulator defolient or desiccant or as an adjuvant and includes any similar product so designated by regulations made under this Act.

Annex II

IMPORT STATISTICS OF DISINFECTANTS, INSECTICIDES, FUNGICIDES HERBICIDES AND OTHER PESTICIDES, ACCORDING TO THE CLASSIFICATION OF THE CUSTOMS DEPARTMENT : VOLUME IN M/T AND VALUE IN RUPEES MILLION

	1979		1980		1981	
	Volume	Value	Volume	Value	Volume	Value
A. DISINFECTANTS						
i. Specified in formulary & gazetted	72.033	2.449	5.225	.070	2.394	.113
ii. Not specified in formulary	-	-	9.667	.818	27.001	1.736
B. INSECTICIDES						
i. Specified in formulary & gazetted	2419.409	57.957	98.849	6.905	185.776	17.989
ii. Not specified in formulary	-	-	63.917	3.581	102.766	13.510
C. FUNGICIDES						
i. Specified in formulary & gazetted	236.166	8.606	181.297	6.865	153.012	6.081
ii. Not specified in formulary	-	-	271.932	11.130	126.602	4.411
D. HERBICIDES						
i. Specified in formulary & gazetted	313.190	14.495	585.289	29.838	955.806	40.765
ii. Not specified in formulary	-	-	-	-	155.897	7.954
OTHER PESTICIDES						
i. Specified in formulary & gazetted	5.393	.595	2.041	.168	19.196	2.779
ii. Not specified in formulary	68.064	1.891	2.596	2.596	21.063	1.080
	3115.700	85.993	1299.762	61.971	1749.513	96.418

COUNTRY WISE IMPORT OF PESTICIDES

(MAIN COUNTRIES ONLY)

COUNTRY	Volume (MT)			Value (Rs. Mln.)		
	1979	1980	1981	1979	1980	1981
ASIA						
Singapore ..	51.050	64.387	167.889	2.438	2.956	2.699
Japan ..	43.481	105.187	58.239	2.304	6.892	9.192
Pakistan ..	-	2.018	-	-	.139	-
Taiwan ..	-	16.500	22.28	-	.735	2.495
India ..	6.841	1.811	2.989	.116	.067	.165
Malaysia ..	25.056	9.350	16.102	3.221	3.396	3.577
China ..	8.700	84.951	84.591	.080	.813	2.124
Total ..	135.128	284.184	352.090	8.159	14.998	20.250
OTHER COUNTRIES						
U.K. ..	116.943	128.666	372.497	5.955	8.563	19.249
W. Germany ..	318.298	325.255	444.533	10.478	12.167	18.432
E.Germany ..	-	36.072	-	-	2.014	-
U.S.A. ..	2345.138	224.799	220.665	52.916	10.266	19.521
Denmark ..	7.545	48.581	136.934	.510	1.979	3.519
France ..	6.940	42.585	7.068	.188	1.094	.640
Italy ..	8.480	5.003	16.300	.308	.582	1.411
S.Africa ..	5.000	5.016	4.005	.095	.185	.161
Switzerland..	37.044	10.090	27.536	2.741	1.168	1.878
Belgium ..	26.112	7.000	.274	.193	.068	.013
Netherlands..	46.483	104.888	150.335	1.630	2.436	5.126
Norway ..	40.000	40.000	5.000	1.525	1.707	.231
Total	2957.983	977.955	1385.147	76.539	42.223	70.181
Grand Total (excludes small imports) ..	3093.111	1262.139	1737.237	84.698	57.221	90.43
Grand total all Countries ..	3115.700	1299.762	1749.513	85.993	61.971	96.418

ANNEXURE IV

RISK TO WORKERS IN THE FORMULATING FACTORIES OF SRI LANKA

1. **HEALTH STATUS (Pre-employment)**

Haematology and clinical chemistry : not screened
Allergic hypersensitivity : Not checked
Physiological status : eg. Pregnancy : Not checked
Illness status : Not screened

2. **MEDICAL EXAMINATION - During Employment :**

Cholinesterase test : weekly (cut-off point of exposure 50% or less)
Other clinical tests : Not done
Periodic medical examination : Medical examination only on request.

3. **HYGIENE FACILITIES**

Cloak room facilities : Not satisfactory
Washing facilities : Poor
Meal room facilities : Not satisfactory
Working conditions : Not satisfactory
Laundering facilities : Not available
Advice on hazards to workers : Not freely available.

4. **WORKING ENVIRONMENT**

General ventilation : Inadequate in most of the factories
Local exhaust ventilation : Very poor
Air conditioning : None of the factories are air conditioned
Work clothes : Provided to workers, but laundry facilities poor
General cleaning : Poor in most of the factories.

5. **PROTECTIVE EQUIPMENT AND PRECAUTIONS**

Respiratory protection : Respirators available, but not of the approved type.

Hands : Gloves are available, but rarely made use of by the workers.

Protective clothing : Overalls are provided at some places, these are not satisfactory.

Foot : Footgear provided in some factories, even then they are not put into proper use.

Maintenance and cleaning up equipment - very poor.

6. **FIRST AID FACILITIES**

Available, but not to the requirements of the industry.

7. **WORK ROOM ENVIRONMENTAL CONTROL** ; Very poor.

8. **ENVIRONMENTAL SAFETY PRECAUTIONS** : Poor